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Sweet-Curd Cottage Cheese

Directions for Manufacturing With an Enzyme

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By P. H. Tracy and
H. A. Ruehe

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Urbana, Illinois January, 1936

Sweet-Curd Cottage Cheese

Directions for Manufacturing With an Enzyme

By P. H. Tracy, Associate Chief in Dairy Manufactures, and
H. A. Ruehe, Chief in Dairy Manufactures

COTTAGE CHEESE is an excellent, highly nutritious food[a] and when properly manufactured can be made so palatable that most people will enjoy eating it in one form or another. Sweet-curd cottage cheese, because of its popularity, can be made to serve as a profitable outlet for some of the surplus skim milk in Illinois milk plants.

Increased sales of cottage cheese during recent years have probably been due to the adoption of manufacturing methods that have produced a cheese of more pleasing flavor and more uniform characteristics. The new type of cottage cheese that seems to be meeting with popular approval is a sweet-curd cheese, from which the excess acid has been removed by washing. The curd is in the form of large, soft, mellow flakes.

Various methods of manufacturing cottage cheese are used. The difference in procedures is due, in part at least, to the difference in ideas on the part of manufacturers as to what constitutes a desirable product. It is practically impossible to give specific directions for making cheese that will be applicable to all plants, owing to differences in types of equipment and materials, particularly to differences in the milk. Modern cheese making is, to a certain extent, an art, experience being necessary before the cheese maker can consistently produce a high-quality product. Procedures followed today may have to be altered tomorrow because of slight differences in the reaction of the milk constituents. Unless the cheese maker is trained by practice in the art of cheese making, he is not likely to appreciate the significance of such differences when they occur, and will be puzzled by consequent unsatisfactory results.

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[a]Cottage cheese contains from 71.4 to 79.9 percent moisture, 12.7 to 21.1 percent protein, .8 to 2.5 percent ash, and .4 to 1.9 percent fat, according to data reported by associates of Rogers in "Fundamentals of Dairy Science," page 38, published by the Chemical Catalog Company, New York, 1928. O. R. Overman reports in Illinois Station Circular 235 (1919) the following analysis and energy value of cottage cheese: protein, 20.9 percent; fat, 1.0 percent; carbohydrates, 4.3 percent; total calories per pound, 498.1. The weight of a quantity equivalent to the caloric value of a quart of milk containing 4 percent fat is 1.326 pounds.

This circular gives the general procedures recommended for making sweet-curd cottage cheese by the 16-hour method and by the 5-hour method. Both methods use an enzyme as the coagulant. The recommendations are in accord with the conclusions of a study made during 1926-1935 on the more common factors relating to quality of sweet-curd cheese.

FACTORS RELATING TO QUALITY OF SWEET-CURD COTTAGE CHEESE

The more common factors relating to the quality of sweet-curd cheese have been studied on an experimental basis in a large number of experimental and commercial batches of cheese. The general conclusions from this study are:

1. Either rennet and pepsin or commercial enzymes may be used as the coagulant in making sweet-curd cottage cheese. The amount of enzyme needed will depend upon its strength. One cubic centimeter of rennet and ½ gram of pepsin per 100 gallons of milk will usually produce the desired results. The amount of the commercial coagulant recommended by the manufacturer is usually satisfactory.

2. When less than the recommended amount of enzyme is used, the curd is likely to be too firm and dry. When too much enzyme is used, the curd becomes too soft and smooth like a Neufchâtel body. A higher cooking temperature is necessary as the amount of enzyme is increased.

3. When the milk is set for 16 to 18 hours at 72° F. after the starter is added, practically the same acidity will develop in the whey regardless of whether 1, 2, or 3 percent of starter is added. Most of the acid is developed by the end of 15 hours.

4. Cheese has the best body when the developed acidity in the whey is .55 to .60 percent. If less than this amount of acid is present when the cheese is cooked, the curd will be tough and dry. If too much acid is permitted to develop, the cheese will be too soft and will drain slowly. Higher cooking temperatures are also necessary with increased whey acidities.

5. As the temperature of pasteurization used for the skim milk is increased from 140 to 145 and 150° F., the curd particles will become smaller and more difficult to drain properly. Also as the length of time of pasteurizing is increased from 30 to 60 minutes, the curd will become softer and will break down more readily during the heating

process. The effect of the longer pasteurizing period upon the curd is more noticeable at the higher temperature.

6. The cut curd shatters rather easily, especially during the first part of the cooking process, so that the amount of agitation given the curd should be limited to a minimum until the temperature of the whey reaches at least 90° F. Shattering can be partially prevented by carefully adding hot water to the freshly cut curd. The volume of the water should be limited to about one-third that of the milk. The temperature of the water should be about 110° F.

7. The temperature necessary to expel the whey properly from the curd varies with conditions. Higher cooking temperatures are necessary: (a) when the amount of enzyme is increased; (b) when the amount of acid in the whey is increased; (c) when the temperature of pasteurization of the milk is increased; (d) when the length of the period of pasteurization is increased; (e) when the heating period is shortened.

When about 1 cc. of rennet and 1 percent of starter are used to each 100 gallons of skim milk, and the milk is held at 72° F. for 16 hours, the curd is usually ready to cut. After cutting, the temperature of the whey should be raised gradually to about 115° F. in 60 minutes. During the early spring months, March and April, it is sometimes necessary to add about 100 cc. of 50-percent calcium chlorid solution to each 100 gallons of milk to get the curd to cook out properly.

8. Washing the curd twice with cold water removes the excess acid and produces a sweeter tasting cheese. The first rinse water should not be too cold or the curd will become tough on the outside.

DIRECTIONS FOR MAKING SWEET-CURD COTTAGE CHEESE

The following directions for making sweet-curd cheese take into consideration the above described factors relative to quality.

Sixteen-Hour Method

1. Select a good grade of raw skim milk. Heat to 142 to 145° F. for 30 minutes and cool immediately to 72° F.

2. Add 1 gallon of starter and 1 cc. of rennet (diluted with ½ pint of cold water) to each 100 gallons of milk.

3. Adjust temperature to 72° F. in winter time and 68° F. in summer time.

4. When the acidity of the whey is .55 to .60 percent, the curd is ready to cut (Fig. 1). The whey will reach this acidity after about 16 hours. Using the curd knife, cut the curd into cubes of uniform size, cutting first horizontally and then vertically.

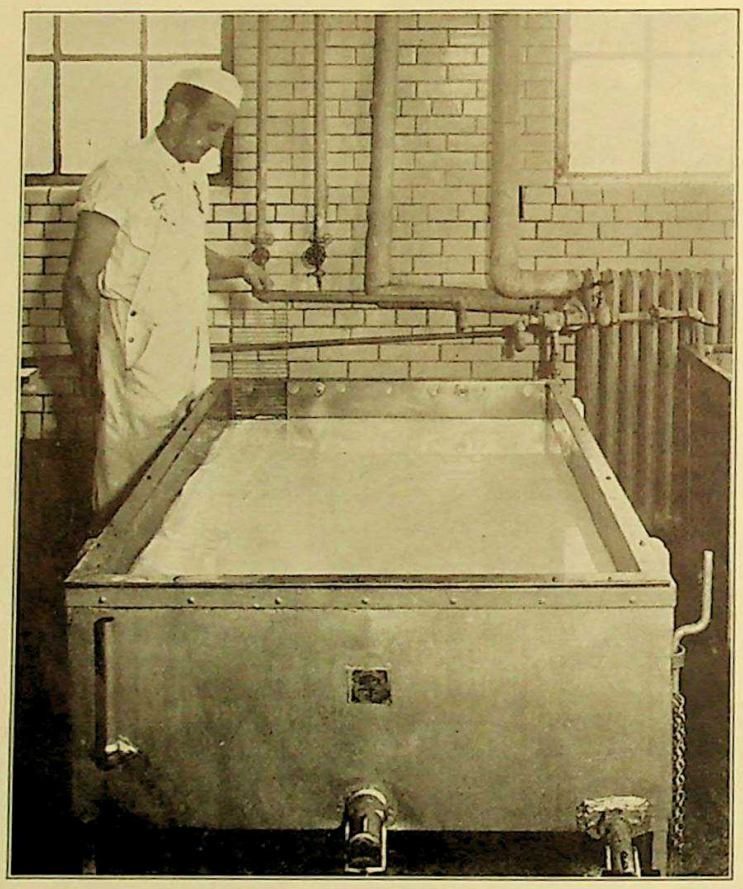

FIG. 1.—CUTTING THE CHEESE CURD
The curd should be cut when the whey acidity has reached 55 to 60 hundredths of 1 percent.

5. Turn the steam on in the jacket and slowly heat the whey to about 115° F., taking at least 60 minutes to reach that temperature. During the first part of the heating process the curd should be agitated only enough to keep that along the sides and bottom of the vat from

heating too rapidly. This can be done with the cheese rake or stirring rod by gently pulling the curd inward and upward, and mixing it with the whey.

To prevent shattering of the curd, it is very important not to agitate the curd more than is necessary to maintain uniform heating. Agitation should be particularly avoided before a temperature of 90° F. has been reached. If the heat is transmitted to the whey rather slowly, it may be advisable to start the heating by mixing hot water with the freshly cut curd. The water should not exceed 110° F., should be limited to about one-third the volume of the skim milk, and should be added carefully so as not to shatter the fragile curd particles.

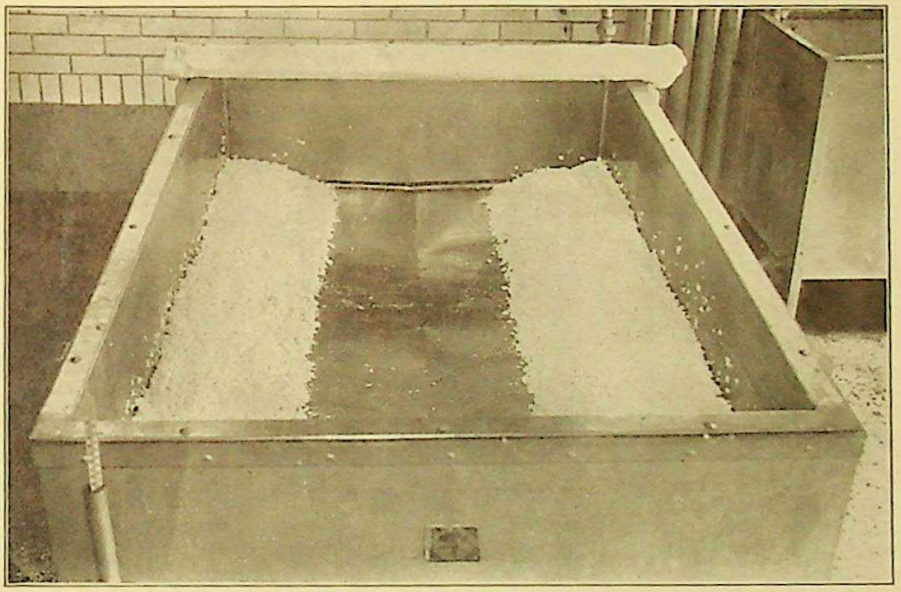

FIG. 2.—CURD DURING DRAINING PROCESS

For sanitary reasons the vat should be kept covered during the setting of the cheese and during the draining of the curd. The canvas cover used on the vat pictured above is rolled back to show the curd banked to facilitate draining. The curd should be permitted to drain dry before creaming.

Occasionally the curd is gassy and floats on top of the whey. This condition may be due to the use of contaminated starter, improper pasteurization of the skim milk, or to the use of a poor quality of milk. Such curd will sometimes sink after it has been heated awhile, but it will make only a fair grade of cheese.

6. After the whey reaches 115° F. the heating process may need

to be continued for a few minutes to obtain the proper firmness of the curd. The whey should not be removed until the curd particles split clean when pressed and the inside of the curd particles appear free from whey. Excessive heating should be avoided as it will cause the curd to become too dry.

7. When the curd is properly firmed, drain the water in the jacket and drain the whey. Then add an equal amount of cold water (65° F.). Drain this water after a 5-minute period and add another equal volume of wash water (45° F.). Again drain after the curd has been in the water 10 minutes.

8. Trench the curd and permit it to remain in the vat with cold water circulating in the jacket until all the loose water has drained away (Fig. 2). Special draining racks are now available, which can be wheeled into a refrigerated room for the final drainage (Fig. 3).

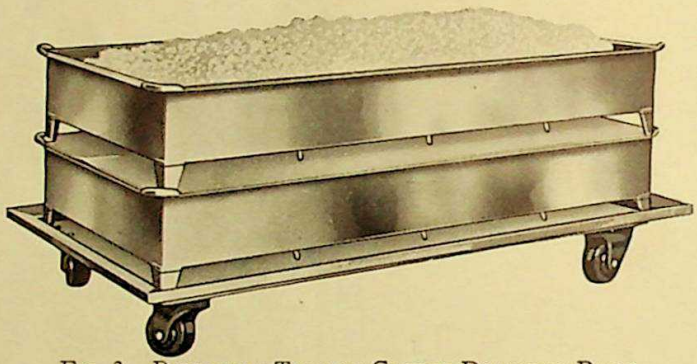

FIG. 3.—ROLLAWAY TYPE OF CHEESE-DRAINING RACK

By use of the rollaway type of cheese-draining rack, the draining of the curd can be conveniently completed in one of the refrigerated rooms. The metal construction shown here is more desirable than wood because it is more sanitary and is less likely to be a source of absorbed odors or flavors.

9. When sufficiently drained, the curd can be creamed and salted and packaged directly out of the vat. If not needed immediately, the curd can be stored 4 or 5 days before being prepared for packaging.

When cheese is made in large quantities, a mechanical mixer is a labor saver (Fig. 4). Salt should be added at the rate of 3 ounces to 12 pounds of curd (the yield of 10 gallons of milk).

The amount and test of the cream used will depend upon the consistency desired in the finished product. Enough fat should be added to result in a test of 5 percent in the finished product. If a wet cheese is desired, add a high-testing milk (10- to 15-percent fat). If a drier,

better-keeping product is desired, use a 35- to 40-percent cream. The creamed cheese shown in Fig. 5 has been mixed with a 22-percent cream. The viscosity of the cream can be increased by homogenizing.

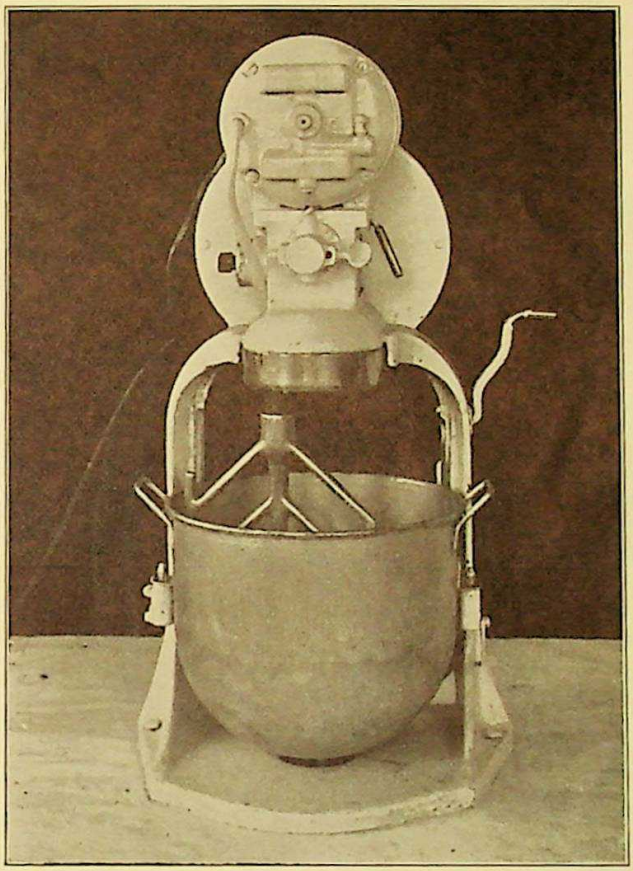

FIG. 4.—MECHANICAL MIXER FOR CREAMING CURD

Ordinarily the curd is mixed with salt and cream in such proportion as to give a fat content of 5 percent. If small batches of cheese are to be prepared, an aluminum dishpan and mixing spoon can be used. For large batches, a mechanical mixer, such as the one illustrated, may be more satisfactory.

A lower testing cream can be used without causing the cheese to become too wet by adding gelatin at the rate of 5 or 6 ounces to 10 gallons of cream. The gelatinated cream will help to maintain the individuality of the curd particles and will cause the mixture to take on a certain amount of luster. The use of gelatin in cottage cheese must be indicated on the label of cheese sold in Illinois.

Five-Hour Method

For plants in which it is more convenient to set the cheese in the morning and cook it out before evening, the five-hour method has been developed. The time necessary to make the cheese is shortened by using about 10 percent of starter and setting the cheese at 90° F. In 4½ to 5 hours, the curd is ready to cut. Usually slightly more rennet is necessary when this method is followed. It may be used to advantage in the summer when the 16-hour method is impractical because

FIG. 5.—CURD BEFORE AND AFTER CREAMING

The curd on the left is uncreamed. That on the right has had enough 22-percent homogenized cream added to give it a fat content of five percent. The creamed cheese after packaging is shown in the center.

of the difficulty in preventing the temperature of the ripening curd from rising above 72° F. The procedure follows:

1. Using a good grade of raw skim milk, pasteurize at 142 to 145° F. for 30 minutes. Cool to 90° F.

2. Add 10 gallons of starter and 1¼ cc. of rennet, diluted with ½ pint of cold water, to each 100 gallons of milk.

3. When the acidity of the whey is .55 percent, cut the curd into cubes of uniform size. It is important not to let the whey acidity get too high.

4. Heat the curd to 115° F. in 45 minutes and hold at this temperature until the curd is properly firmed.

5. Drain, wash, and cream the curd as directed under the 16-hour method.

CAUSES OF COMMON BODY DEFECTS IN SWEET-CURD COTTAGE CHEESE

The beginner is very likely to experience some difficulty in obtaining the desired type of curd; the curd may be either too firm or too soft. A tough and rubbery curd may be caused by any one of the following conditions:

1. Not enough acid was developed in the curd before it was heated.
2. Not enough enzyme was used.
3. The curd was subjected to too high or too prolonged a cooking temperature.

A soft pasty curd that does not drain properly may be due to:

1. Too high an acid development in the whey before heating.
2. Use of too much enzyme.
3. Not heating the curd high enough or long enough.
4. Use of milk that has been pasteurized at too high a temperature or held too long at the pasteurizing temperature.

LIGHT RAYS AFFECT FLAVOR OF CHEESE CURD

A disagreeable burnt flavor[a] may result from the exposure of cottage cheese in glass or open containers to either direct or indirect sunlight. The flavor is more pronounced in curd exposed to direct sunlight. Creamed curd is not affected to the same extent as is uncreamed curd.

The rapidity with which the flavor develops varies with the intensity of the sun's rays. On ordinary bright days curd exposed in plain glass containers to direct sunlight will have a pronounced burnt flavor in 10 minutes; that exposed to indirect sunlight will have a slight, yet noticeable, burnt flavor in 10 minutes. Altho the intensity of the burnt flavor can be reduced by increasing the number of layers of glass thru which the sunlight passes before striking the curd, three layers of glass do not entirely prevent the development of this flavor defect.

PACKAGING COTTAGE CHEESE

Either glass or paper containers are satisfactory for marketing cottage cheese (Fig. 6). Glass has the advantage of suggesting greater cleanliness to the purchaser and displays the cheese to better advantage. Also, glass cheese jars may be somewhat cheaper, the difference in cost depending largely upon the number of trips per jar. When single-service glass tumblers are used, the added expense of the container may be offset to some extent by its reduced size. It should not be

[a]Tracy, P. H., and Ramsey, R. J. Sunlight develops off-flavors in cottage cheese. Milk Dealer **21**, 48. May, 1932.

overlooked that cheese exposed to sunlight in plain glass containers will acquire a burnt flavor.

Paper containers used for cheese should be paraffined to prevent the absorption of moisture. The paper container has the advantage of being reasonable in cost, easy to prepare for use, and easily filled.

FIG. 6.—COMMON TYPES OF CHEESE PACKAGES
A sanitary package should be used to market the cheese. It may be of glass, paraffined paper, or crockery.

It can also be made to carry advertising. The main objection to the paper containers is that they are limited to a single service and thus may be somewhat more expensive than glass containers.

ALWAYS SUPPLY FRESH CHEESE TO CONSUMERS

Nothing will ruin cottage cheese sales quicker than to have sour or moldy packages reach the consumer. A fresh product should be delivered daily to stores distributing cottage cheese; and cheese returned from milk routes should never be permitted to make a second trip.

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